A STUDY OF TOPICAL THERAPY IN TINEA CAPITIS*

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Thirteen treatment agents (Table 1) were evaluated in eight hundred eighty-one clinical trials in 460 patients (Table 2). Prior to treatment fluorescence in infected areas was detected with the Wood's Light and cultures of fluorescent hair were made; 83.2% were positive for M. audouini, 1.0% were positive for M. lanosum and 15.7% showed no growth or were contaminated. Each compound was used for at least three months before it was considered ineffective. Medication was applied twice a day and hair was clipped once a week. Manual epilation was not allowed. Examination were made every two weeks. Cure was determined by disappearance of fluorescence in infected areas, regrowth of normal hair and absence of fluorescence for 90 days after termination of treatment. The results are summarized in Table 3. The 75% cure rate in the group of 132 patients treated with 5-chlorosalicylanilide (No. 13) indicated that this drug was superior in this series by the method of testing. For 2 to 3 weeks preceding disappearance of fluorescence there was a replacement of the bright shiny green color of the infected hairs by lustreless white. Dermatitis from the ointment occurred in 4 patients (3%) Table 3. Of the 132 patients treated with 5-chlorosalicylanilide there were 108 with positive cultures for M. audouini; data concerning this group are summarized in Table 4; the cure rate was 73.1%.

DISCUSSION

Kligman and Anderson (1) contend that there is a high percent of spontaneous cure in tinea capitis and emphasize three considerations in the evaluation of topical therapy: 1. Spontaneous cures occur in non-inflammatory cases after prolonged periods ranging from 3 months to 2 years (2); 2. Complicating inflammatory reactions such as folliculitis and kerion formation accelerate healing (3) (1); and 3. So-called fungistatic agents are relatively ineffective in killing the fungus in infected hair (4) (5). It has been observed that spontaneous cure is associated with puberty (7). There is evidence (1) that the more extensive the area of scalp involvement, the more resistant will be the infection to topical therapy. Cures have been reported after application of substances that are neither fungicidal or fungistatic, such as carbowax (1) and hormones (8).

The results with 5-chlorosalicylanilide, the best of the thirteen compounds tested, must be evaluated with consideration for the aforementioned contentions and facts. Cures were accomplished in 8 weeks or less in 79.7%, and in less than 6 weeks in 59.7% (Table 4); 88.6% of the cured patients were less than 10 years old. However folliculitis and kerion complicated 13.9 per cent of the cases treated

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TABLE 1

Compositions and formulae of agents evaluated in topical therapy of tinea capitis

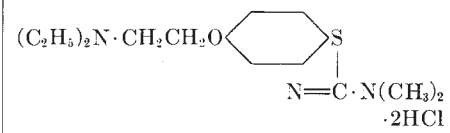
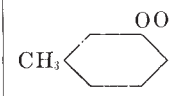
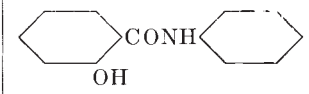
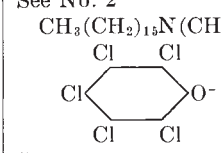
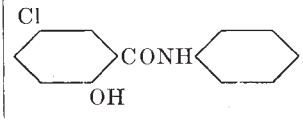
No.	ACTIVE INGREDIENT Name	Content	BASE	FORMULA OF ACTIVE INGREDIENT
1	Propylene glycol dipelargonate	100%		$CH_3(CH_2)_7COOCH_2$ $CH_3(CH_2)_7COOCH \cdot CH_3$
2	Undecylenic acid Zinc undecylenate	22% 3%	Carbowax	$CH_2{=}CH(CH_2)_8COOH$ $[CH_2{=}CH(CH_2)_8COO^-]_2Zn$
3	Dihydrochloride of 2-Dimethyl-amino-6-(beta-diethyl-aminoe-thoxy)-benzo-thiazole	2%	Carbowax	
4	Metacresyl acetate	80%	Ethycellulose	
5	Salicylanilide	5%	Carbowax	
6	Ammoniated Mercury	10%	Fatty base	U. S. Pharmacopeia
7	Undecylenic acid Zinc undecylenate Salicylanilide	22% 3% 5%	Carbowax	See Nos. 2 and 5
8	Undecylenic acid Copper undecyle-nate	10%	Tetrachlo-ethylene iso-propylalco-hol	See No. 2 $[CH_2{=}CH(CH_2)_3COO]_2Cu$
9	Iodine Sodium Iodide	2% 2.4%	Solusalve	I_2 NaI
10	Dibromsalicyal-delyde	2%	Carbowax	$(Br)_2C_6H_2(OH) \cdot CHO$
11	Undecylenic acid cetyltrimethyl ammonium Pentachlorphe-nate	1%	Emulsion base	See No. 2 
12	Hendecanoic acid and its Sodium salt	3%	Carbowax	See also No. 2
13	5-Chlorosalicyl-anilide	3%	Carbowax	

TABLE 2

Showing sex, race and age of a group of 460 children with tinea capitis

Age in years	1½	2	3	4	5	6	7	8	9	10	11	12	13	14	Male		Female	
															White	Negro	White	Negro
No. of patients	1	4	14	23	28	45	46	56	58	68	54	44	13	6	116	244	32	68

TABLE 3

Results with 13 treatment agents in 881 trials in 460 patients with tinea capitis

	CASES, NUMBER	CURES		FAILURES		CULTURAL FINDINGS			REACTIONS			
									Contact dermatitis		Folliculitis and Kerion	
		Number	%	Number	%	M. audouini	M. lanosum	Negative	Number	%	Number	%
1. Propylene glycol dipelargonate	57	24	42	33	58	48	0	9	3	5.4	5	8.8
2. Desenex	41	17	41	24	59	29	1	11	0	0.0	1	2.4
3. Asteroldihydrochloride	103	42	40	61	60	88	1	14	2	2	12	11.6
4. Cresatin	29	11	38	18	62	21	0	8	2	6.9	2	6.9
5. Salinidol	89	34	26	55	74	74	0	15	1	1.1	9	10.1
6. Ammoniated Mercury Ointment U.S.P.	46	17	37	29	63	44	0	2	1	2.2	5	10.8
7. Salundek	66	20	30	46	70	59	0	7	0	0	4	6.1
8. Decupryl	35	9	26	26	74	26	0	9	0	0	1	2.9
9. Diodine	109	28	25	81	75	96	4	9	11	10.1	13	11.9
10. Dalyde	59	12	20	47	80	52	1	6	2	3.4	5	8.5
11. T.C.A.P	31	5	16	26	84	26	1	4	0	0	2	6.5
12. Hendyl	84	12	14	72	86	62	1	21	0	0	5	6
13. Chlorosalicylanilide	132	99	75	33	25	108	0	24	4	3	11	8.3

TABLE 4.

Cure rate, ages, length of treatment, occurrence of folliculitis and/or kerion, area of scalp involvement in 108 patients with cultures positive for M. audouini, treated with 5-chlorosalicylanilide ointment

CURES		FAILURES		AGES IN YEARS													LENGTH OF TREATMENT IN WEEKS							FOLLICULITIS AND KERION		AREA OF SCALP INVOLVEMENT							
																										25% or less		25% to 50%		50% to 75%		100%	
No	%	No	%	1	2	3	4	5	6	7	8	9	10	11	12	13	2	4	6	8	10	12	14	No	%	No	%	No	%	No	%	No	%
79	73.1			1	2	4	6	10	8	9	12	10	8	6	3		70	16	21	16	7	6	3	11	13.9	51	64.5	20	25.3	8	10.1	0	
		29	26.8	1	2	2	2	2	3	5	4	2	2	2	1	1					14	11	4	2	6.8	8	27.5	7	24.1	10	34.4	4	13.7

with this chlorinated product; also cure rates were proportional to extent of scalp involvement (Table 4). The asterol ointment evaluated in this study contained 2 percent of the drug. The results reported by other investigators (8) (9)

are based on observations of the efficacy of 5 per cent Asterol Ointment. No controls with unmedicated carbowax were conducted, but 6 antifungal agents (No. 2, 3, 5, 7, 10 and 15, Table 2) incorporated in carbowax produced cure rates respectively of 41%, 42%, 26%, 30%, 20%, and 14%.

SUMMARY

Of 13 agents tested topically in tinea capitis 5-chlorosalicylanilide was the most effective producing 73.1% cures in a group of 108 patients with infections caused by M. audouini. These results should be interpreted with consideration for all of the factors which may influence the healing of fungous infections of the scalp (1).

REFERENCES

1. Kligman, A. M. and Anderson, W. W.: Evaluation of current methods for the local treatment of tinea capitis. J. Invest. Dermat. **16:** 155, 1951.
2. Livingood, C. S. and Pillsbury, D. M.: Ringworm of the Scalp. Prolonged observations, family investigation, cultural and immunologic studies in 130 cases. J. Invest. Dermat. **4:** 43, 1941.
3. Scully, J. P., Livingood, C. S. and Pillsbury, D. M.: The local treatment of tinea capitis due to M. Audouini. The importance of inflammatory reaction as an index of curability. J. Invest. Dermat. **10:** 111, 1948.
4. Mitchell, J. H.: Epidemic ringworm of the scalp. M. Clin. N. America. **32:** 283, 1948.
5. Robinson, H. M.: In vitro studies of M. Audouini infections of the hair. Arch. Dermat. & Syph. **57:** 991, 1948.
6. Rothman, S., Smiljanic, A., Shapiro, A. L., Wertkamp, A. W.: The spontaneous cure of tinea capitis in puberty. J. Invest. Dermat. **8:** 81, 1947.
7. Poth, D. O. and Kaliski, T. R.: Estrogen therapy for tinea capitis. Arch. Dermat. & Syph. **45:** 121, 1942.
8. Stritzler, C., Fishman, I. and Laurens, S.: Treatment of superficial fungus infections with a new antifungal agent. Trans. N. Y. Academy of Sciences. **13:** 31, 1951.
9. Edelson, E., Craster, C., and Haskin, A.: Evaluation of a new drug for topical therapy of tinea capitis. Arch. Dermat. & Syph. **64:** 444, 1951.